Formula Sheet for the Class I & A Exams
Revised 05/02

F009
Detention time, hrs =
Volume, MG x 24 hrs/day
Flow rate, MGD

F010
Flow rate, MGD =
Flow rate, gpm x 1440
1,000,000

F011
Removal efficiency, % =
(Influent conc - effluent conc) x 100%
Influent conc

F012
Solids loading, lbs/day =
(Flow, MGD) x (influent TSS, mg/L) x 8.34

F013
Required effluent BOD conc, mg/L =
(Influent BOD, mg/L) x [(100 - required removal, %) / 100]

F014
Volume of a circular tank, cf =
0.785 x (diameter, ft)^2 x (depth, ft)

F015
Sludge volume index, mg/L =
(Settleable solids, %) x 10,000
MLSS mg/L

F016
Average flow rate, MGD =
(Final flow, MG) - (initial flow, MG)
Time elapsed, days

F017
BOD loading, lbs/day =
(Flow rate, MGD) x (BOD, mg/L) x 8.34

F018
TSS removal efficiency, % =
(Influent TSS - effluent TSS) x 100%
Influent TSS

F019

Sludge age, days =
MLSS in aeration tank, lbs
Primary effluent SS, lbs/day

F020
Volume of sample needed for a BOD test bottle, ml =
1200
Estimated BOD of the sample, mg/L

F021
BOD, mg/L =
(Initial D.O., mg/L - final D.O., mg/L) x 300 ml
Sample volume, ml

F022
Chlorine feed rate, lbs/day =
(Flow, MGD) x (dosage, mg/L) x 8.34

F023
TSS test results, mg/L =
Net dry weight, mg x 1000
Sample volume, ml

F024
HTH feed rate, lbs/day =
Chlorine required, lbs/day
Lbs of chlorine in 1 lb of HTH
(HTH = High Test Hypochlorite)

F025
Detention time, hrs =
(Tank volume, cf) (7.48) (24, hrs)
Flow, gpd

F026
Hydraulic loading, gpd/sf =
Flow rate, gpd
Surface area, sf

F027
Chlorine dose, mg/L =
Chlorine, lbs
(Flow rate, mgd) (8.34)

F028
Chlorine demand, mg/L =
Chlorine dosage, mg/L - residual chlorine, mg/L

F029
BOD load, lbs BOD/month =
(BOD conc, mg/L) x (average flow rate, mgd) x
(8.34) x (30 days/month)

F030
Pump capacity, gpm =
$$\frac{\text{(Width) x (length) x (draw-down, ft) x 7.48}}{\text{Time of draw-down in minutes}}$$

F031
D.O. saturation, % =
$$\frac{\text{(D.O. of receiving water, mg/L) x (100\%)}}{\text{D.O. at 100\% saturation, mg/L}}$$

F032
Desired suspended solids, lbs =
(Sludge age, days) x (primary effluent solids, lb/day)

F033
Volume per stroke, gal/stroke =
$$\frac{(0.785) \times (\text{diameter, inch})^2}{(12)^2} \times \frac{\text{(stroke, inch) x (7.48)}}{12}$$

F034
Total dry solids, lbs =
$$\frac{\text{(Raw sludge, gal) (total solids, \%) (8.34)}}{100\%}$$

F035
MLSS, lbs =
(Aeration volume, MG) x (MLSS conc, mg/L) x (8.34)

F036
Return sludge rate, mgd =
(Total flow, mgd) x (Return sludge flow ratio)

F037
Digestion time, days =
$$\frac{\text{Digester volume, gal}}{\text{Flow, gpd}}$$

F038
Phosphorus (P) removal, % =
$$\frac{\text{(Influent P, mg/L - effluent P, mg/L) (100\%)}}{\text{Influent P, mg/L}}$$

F039
Sludge applied, gal =
$$\frac{\text{(Area, sf) x (depth of application, in) x (7.48)}}{12 \text{ in/ft}}$$

F064
F/M, lbs/day =
$$\frac{\text{lbs BOD/day to aeration tank}}{\text{lbs of MLVSS under aeration}}$$